2003

AEM/S Stepping Stone to Stealth

Solitario, William

Monterey, California: Naval Postgraduate School

AEM/S ... Stepping Stone To Stealth

Bill Solitario

Professor Systems Engineering

September 04, 2003

NORTHROP GRUMMAN
Ship Systems

Outline

- Background
- Concept Description
- Manufacturing Approach
- Transition to Fleet
- Summary

AEM/S on USS Radford

NORTHROP GRUMMAN
Ship Systems

BACKGROUND

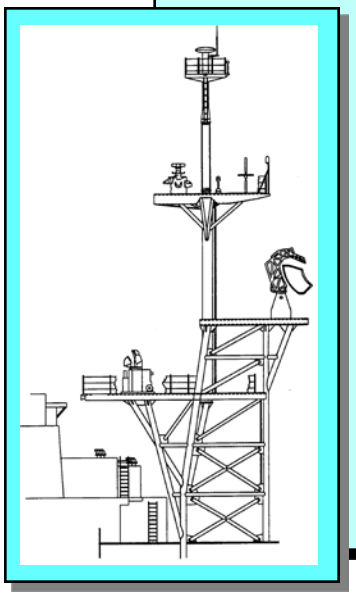
- Half scale DDG Mast
- Composite Structures

NORTHROP GRUMMAN
Ship Systems

ATD PAYOFFS

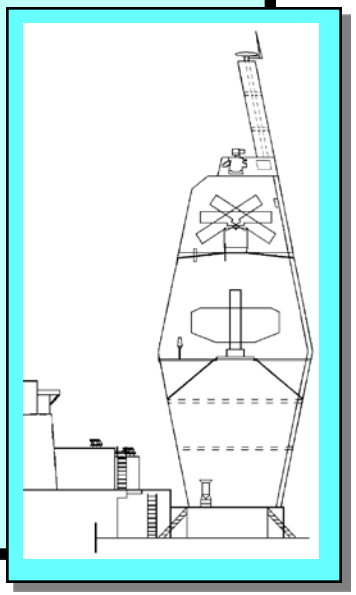
SOLVES PROBLEMS

- **Sensor Performance**
  - Blockage
  - False Targets
  - Sensor Downtime
- **Affordable Signature Control**
- **Topside Weight Limitations**
- **Life Cycle Costs**
  - Sensors
  - PCMS



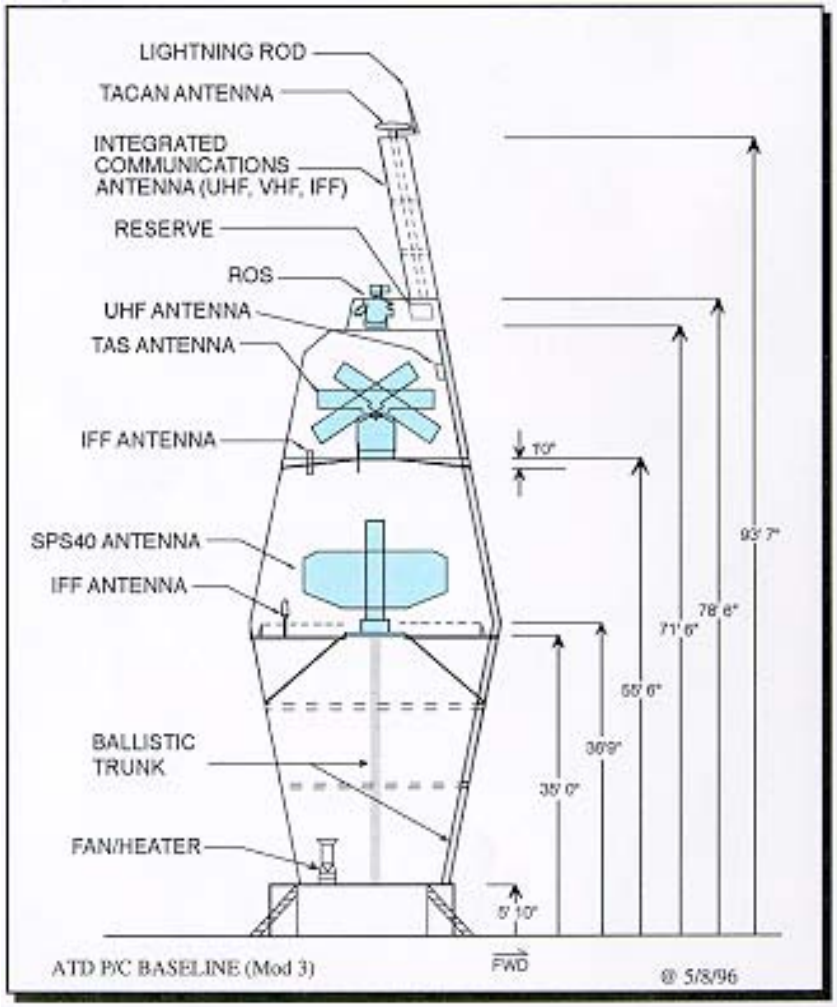
ENABLES NEW TECHNOLOGY

- **Embedded Sensors**
- **Planar Arrays**
- **Low Observable Ship Signatures**



NORTHROP GRUMMAN
Ship Systems

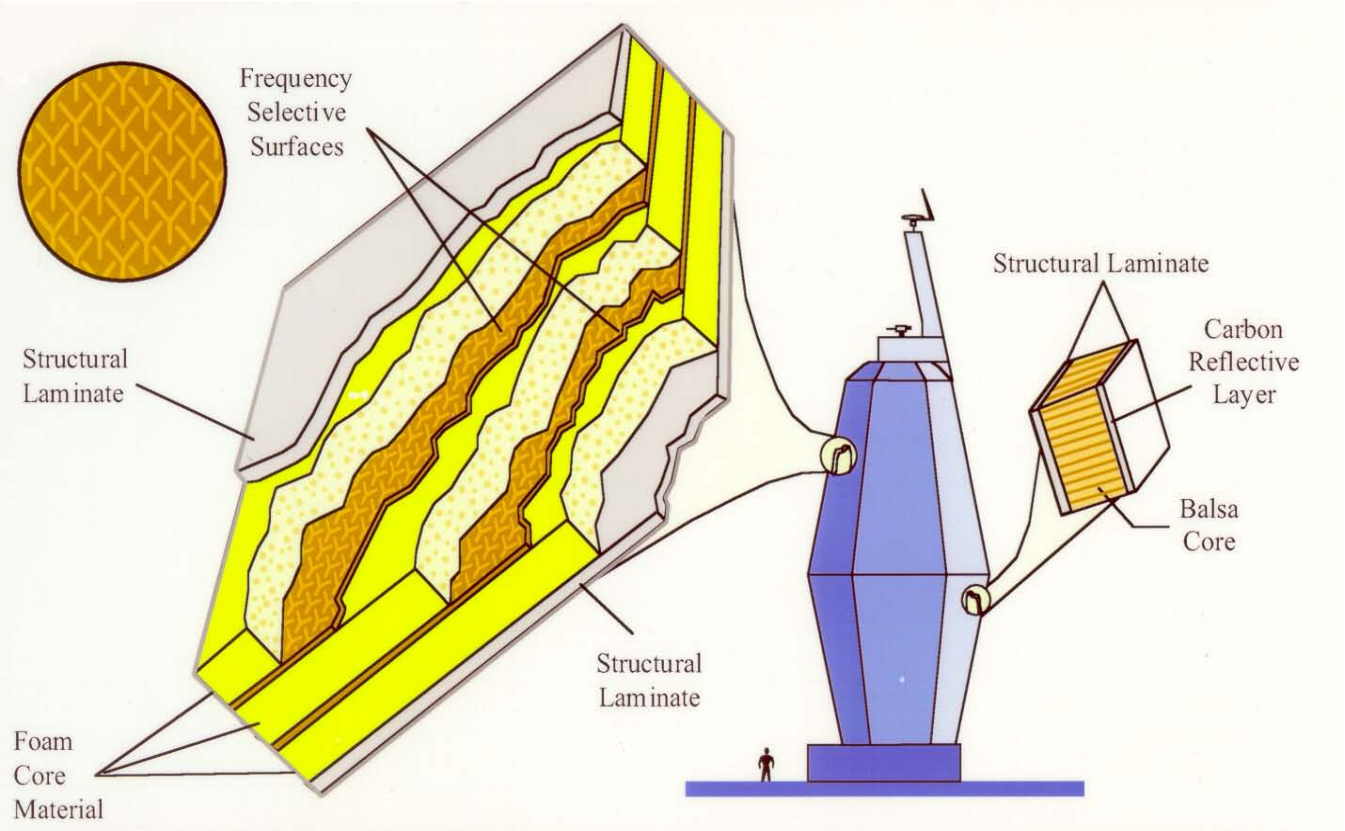
ADVANCED ENCLOSED MAST/SENSOR AEM/S



- **LARGE COMPOSITE STRUCTURE**
  - 71 1/2' High; 31' Dia; 30 Ltons
- **SHAPED TO REDUCE RCS**
  - Hexagonal
  - 10° Slope
- **UPPER HALF**
  - Frequency Selective Structure
  - Integrated Communications
- **LOWER HALF**
  - Reflective; RAS Option
  - Metallic Shielding
- **BALLISTIC WAVEGUIDE TRUNK**
- **INTEGRATED EMI/EMP**

NORTHROP GRUMMAN
Ship Systems

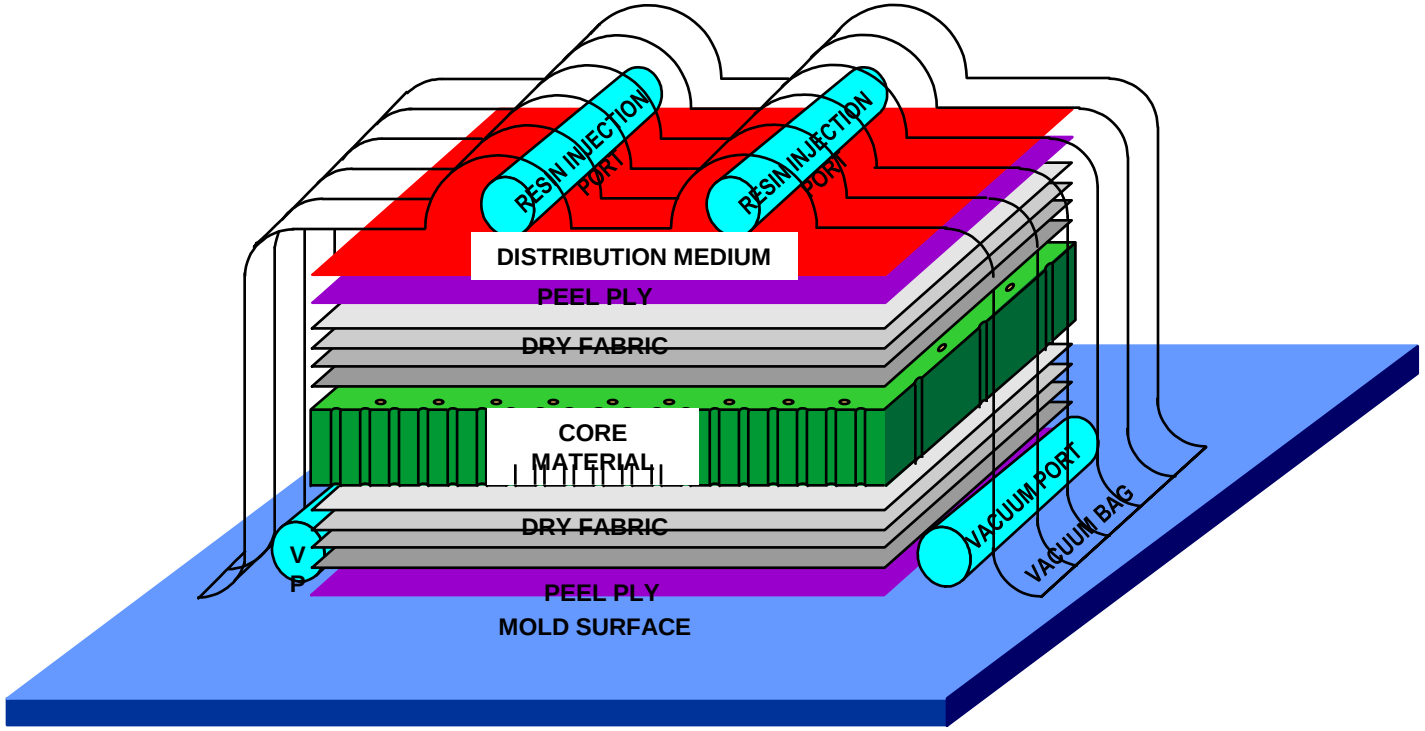
TAILORED MATERIAL SYSTEMS



Manufacturing Process

Seemann Composite Resin Infusion Molding Process (SCRIMP):

- Near Autoclave Laminate Quality At Shipyard Prices
- Extremely Low Void Content Laminate
- High Fiber to Resin Volume Ratio = High Strength to Weight

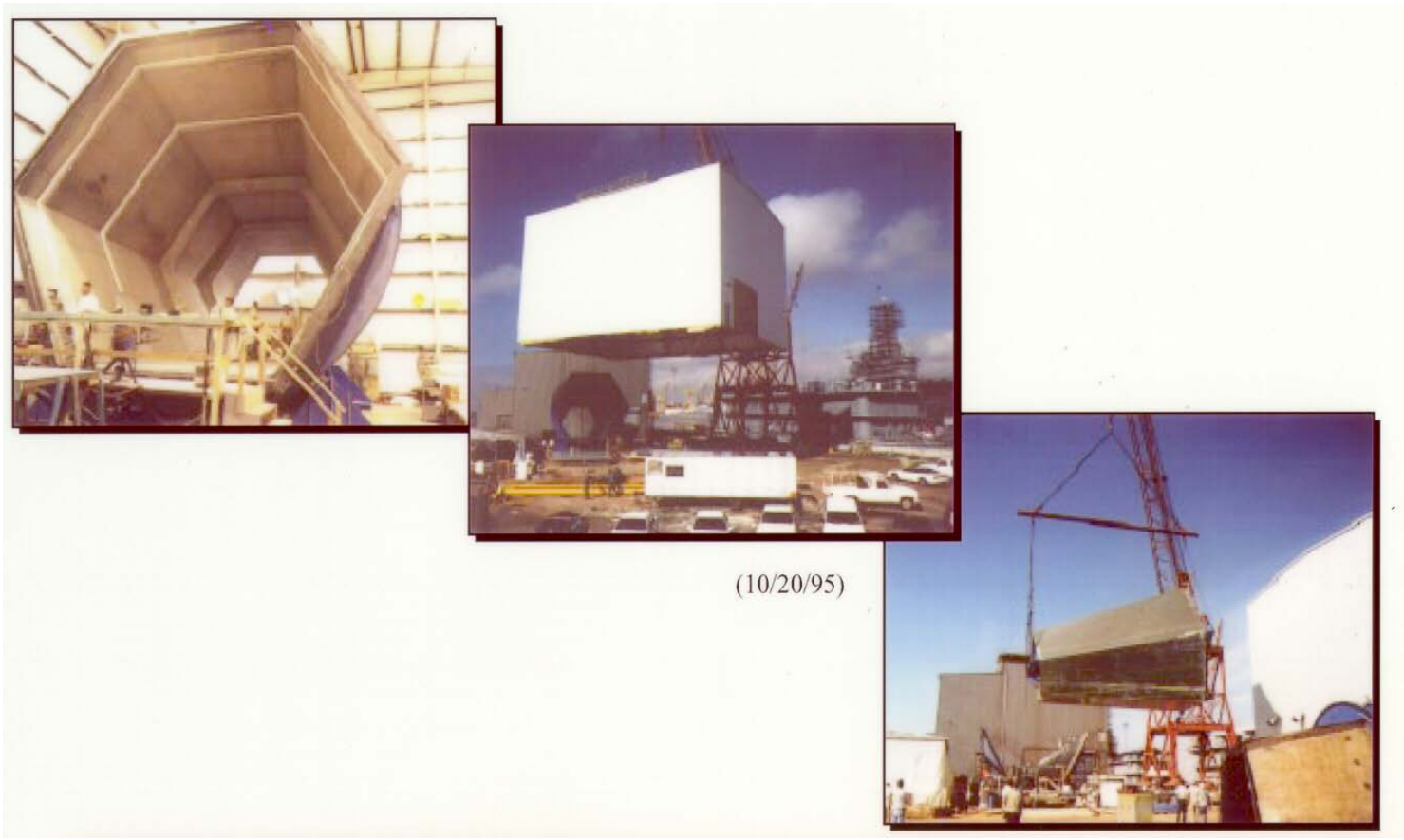


NORTHROP GRUMMAN
Ship Systems

SCRIMP = Cost Effective Advanced Composite Structures

NORTHROP GRUMMAN
Ship Systems

FABRICATING THE STRUCTURAL MAST



NORTHROP GRUMMAN
Ship Systems

The AEM/S Experience – Fiber Reinforcement & Core Lay-up For A Deck

Cloth Lay-up On Mold

Core Laid On Cloth

Core Laid On Cloth

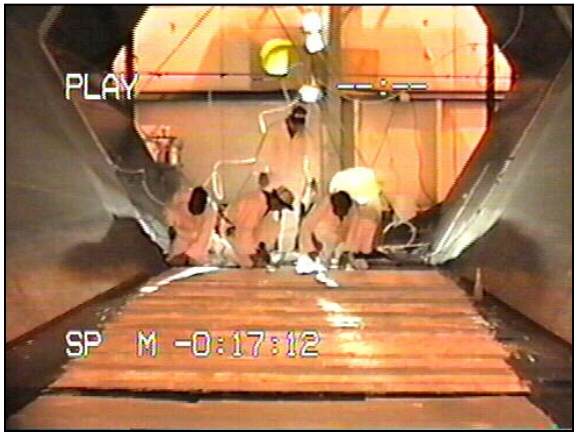
Cloth Lay-up On Core

NORTHROP GRUMMAN
Ship Systems

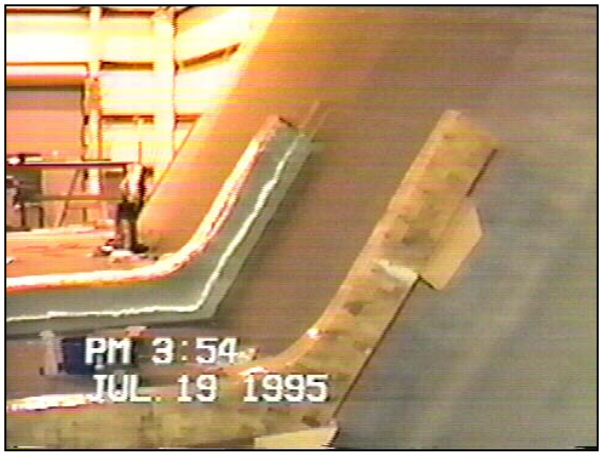
The AEM/S Experience – Fiber Reinforcement & Core Lay-up For The Mast

Cloth Lay-up In Full-Round Mold

Panel Laminated & Mold Rotated

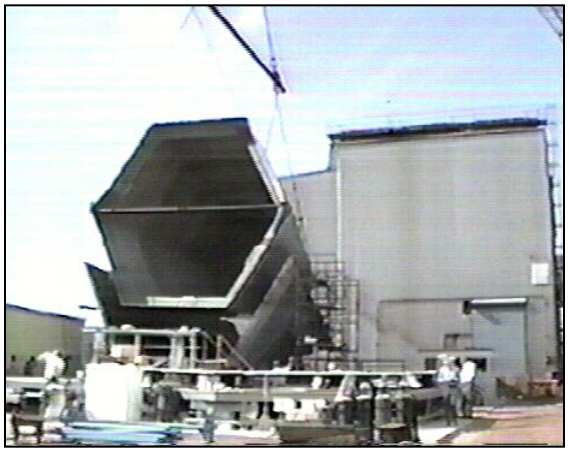


Lay-up For Sixth Side Panel



Ring Girder Installation

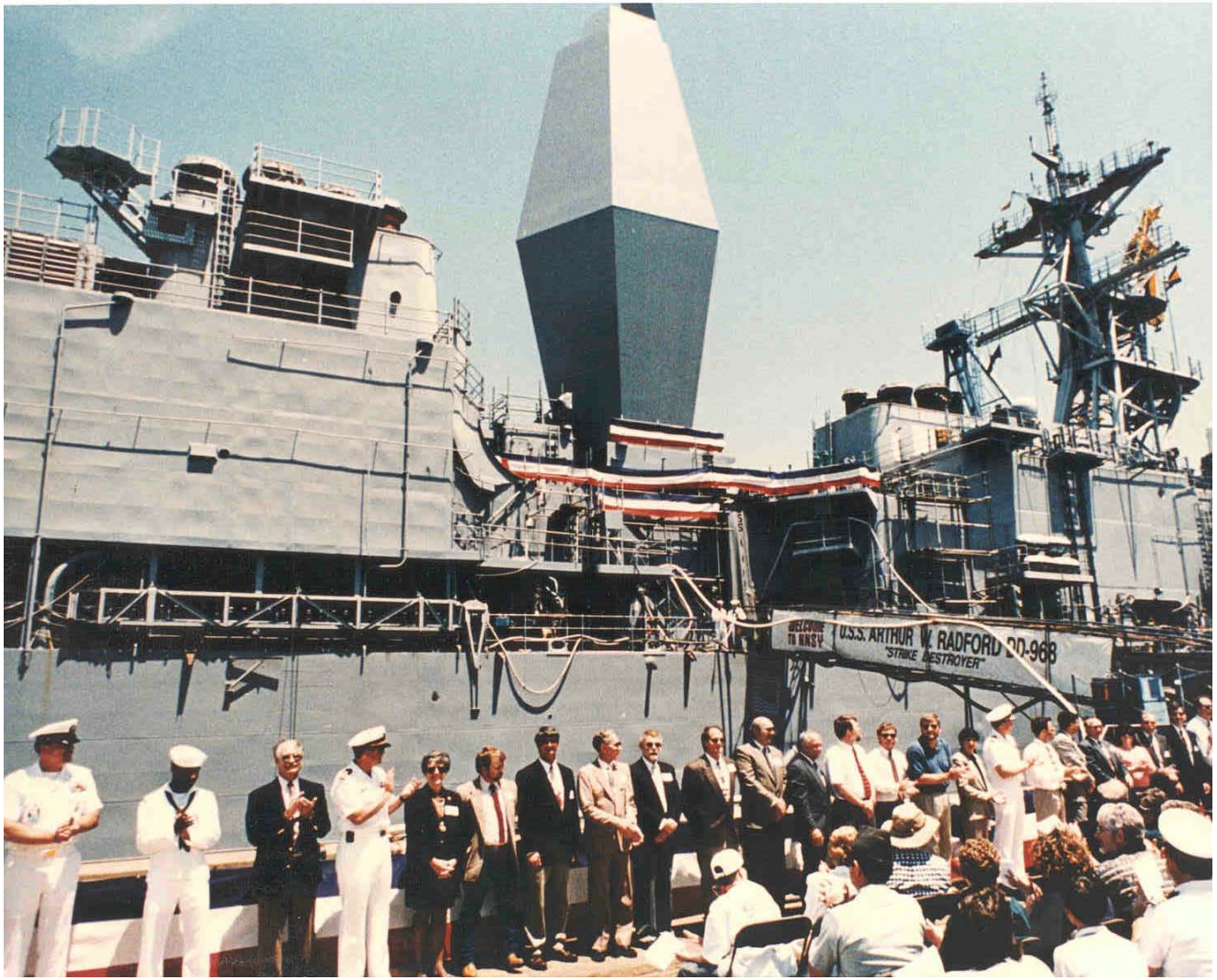
Ring Girders Laminated In-Place



Lower-Half Removed From Mold

NORTHROP GRUMMAN
Ship Systems

The USS Radford AEM/S Mast Stepping Ceremony

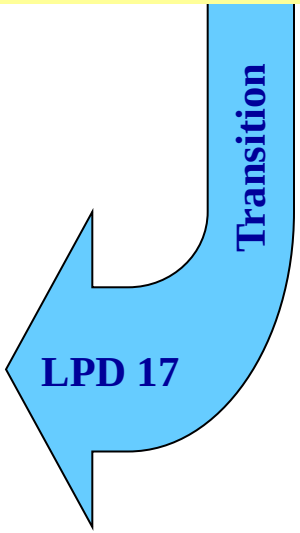


NORTHROP GRUMMAN
Ship Systems

AEM/S Fleet Transition to LPD 17

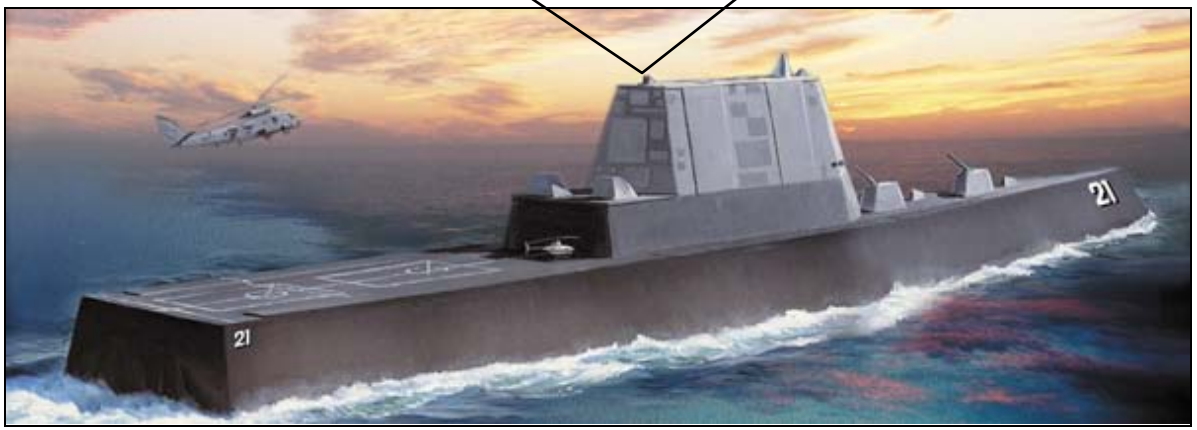
- Successful ONR Funded Advanced Technology Demonstration (ATD) project
- Rapid Transition from R&D to New Construction
- Example of what can be Accomplished when the Navy and Private Industry Work Together

Advanced Composite Mast on USS Radford



NORTHROP GRUMMAN
Ship Systems

Integrated Topside Goal



NORTHROP GRUMMAN
Ship Systems